CLAIMS

1. A power supply apparatus (20) driving and controlling a motor (MG1, MG2), comprising:

a DC power supply (10);

a converter (110) converting a first DC voltage (Vb) from said DC power supply into a second DC voltage (Vm) according to a voltage command value (Vmr) to output said second DC voltage between a first power supply line (103) and a second power supply line (102);

a chargeable and dischargeable electric charge storage unit (120) connected between said first power supply line and said second power supply line;

a motor drive control unit (131, 132) receiving said second DC voltage between said first power supply line and said second power supply line and converting, according to a driving force command value (Tref), said second DC voltage into electric power for driving and controlling said motor; and

a control unit (140) adjusting, when said motor operates in a power running mode, said driving force command value to allow the sum of electric power (Pm) consumed by said motor according to said driving force command value and an amount of change (Pc) in stored electric power of said electric charge storage unit, said change being caused as said second DC voltage changes, to be smaller than a limiting value (Pcvlm) of electric power output from said converter.

2. The power supply apparatus according to claim 1, wherein

said voltage command value (Vmr) is determined according to the number of revolutions (N) and a required driving force (Trq) of said motor (MG1, MG2) and independently of said driving force command value (Tref).

3. The power supply apparatus according to claim 1, wherein

said DC power supply (10) is chargeable,

said motor drive control unit (131, 132) converts, when said motor (MG1, MG2) operates in a regenerative mode, the electric power generated by said motor into said second DC voltage (Vm) according to said voltage command value (Vmr) and outputs said second DC voltage between said first power supply line (103) and said second power supply line (102),

said converter (110) converts, when said motor operates in said regenerative mode, said second DC voltage into said first DC voltage (Vb) to charge said DC power supply, and

said control unit (140) adjusts, when said motor operates in said regenerative mode, said voltage command value (Vmr) as required based on a relation between a combination of the electric power (Pm) generated by said motor and an amount of change (Pc) in stored electric power of said electric charge storage unit (120) that is caused by a change of said second DC voltage (Vm) and a limiting value (Pcvlm) of electric power input to said converter (110).

4. The power supply apparatus according to claim 3, wherein

when said motor operates in said regenerative mode, said voltage command value (Vmr) is adjusted by said control unit as required, after temporarily determined according to the number of revolutions (N) and a required driving force (Tref) of said motor (MG1, MG2).

5. The power supply apparatus according to claim 3, wherein

said control unit (140) inhibits, when said motor operates in said regenerative mode and the electric power (Pm) generated by said motor (MG1, MG2) exceeds the limiting value (Pcvlm) of electric power input to said converter, decrease of said voltage command value.

6. The power supply apparatus according to claim 3, wherein

said control unit (140) restricts, when said motor operates in said regenerative mode and the electric power (Pm) generated by said motor is smaller than the limiting value (Pcvlm) of electric power input to said converter (110), an amount of decrease in said voltage command value so as to balance the amount of change (Pc) in stored electric power of said electric charge storage unit (120) that is caused by the change of said second DC voltage (Vm) with a combination of the limiting value (Pcvlm) of electric power input to said converter (110) and the electric power (Pm) generated by said motor (MG1, MG2).

7. The power supply apparatus according to any of claims 1 to 6, wherein

said control unit (140) calculates said amount of change (Pc) in stored electric power based on said voltage command value (Vmr).

8. The power supply apparatus according to any of claims 1 to 6, wherein

said control unit calculates said amount of change (Pc) in stored electric power based on a detected value of said second DC voltage (Vm).

9. A motor vehicle (100) comprising:

a power supply apparatus (20) as recited in any of claims 1 to 6; and

an AC electric motor (MG1, MG2) provided as said motor driven and controlled by said power supply apparatus and capable of driving at least one wheel (50L, 50R),

said converter provided as a voltage step-up converter capable of making said second DC voltage (Vm) higher than said first DC voltage (Vb), and

said motor drive control unit including an inverter (131, 132) making conversion between said second DC voltage and an AC voltage for driving and controlling said AC electric motor.

10. A motor drive and control method for driving and controlling a motor (MG1, MG2) by a power supply apparatus (20), said power supply apparatus including: a DC power supply (10); a converter (110) converting a first DC voltage (Vb) from said DC power supply into a second DC voltage (Vm) according to a voltage command value (Vmr) to output said second DC voltage between a first power supply line (103) and a second power supply line (102); a chargeable and dischargeable electric charge storage unit (120) connected between said first power supply line and said second power supply line; and a motor drive control unit (131, 132) converting, according to a driving force command value (Tref), said second DC voltage between said first power supply line and said second power supply line into electric power for driving and controlling said motor,

said method comprising a first step (S150) of adjusting, when said motor operates in a power running mode, said driving force command value to allow the sum of electric power (Pm) consumed by said motor according to said driving force command value and an amount of change (Pc) in stored electric power of said electric charge storage unit, said change being caused as said second DC voltage changes, to be smaller than a limiting value (Pcvlm) of electric power output from said converter.

11. The motor drive and control method according to claim 10, wherein said voltage command value (Vmr) is determined according to the number of revolutions (N) and a required driving force (Trq) of said motor (MG1, MG2) and independently of said driving force command value (Tref).

12. The motor drive and control method according to claim 10, wherein said DC power supply (10) is chargeable,

said motor drive control unit (131, 132) converts, when said motor (MG1, MG2) operates in a regenerative mode, the electric power (Pm) generated by said motor into said second DC voltage (Vm) according to said voltage command value (Vmr) and

outputs said second DC voltage between said first power supply line (103) and said second power supply line (102),

said converter (110) converts, when said motor operates in said regenerative mode, said second DC voltage into said first DC voltage (Vb) to charge said DC power supply, and

said motor drive control method further comprises a second step (S240-S260) of adjusting, when said motor operates in said the regenerative mode, said voltage command value as required based on a relation between a combination of the electric power (Pm) generated by said motor and an amount of change (Pc) in stored electric power of said electric charge storage unit (120) that is caused by a change of said second DC voltage and a limiting value (Pcvlm) of electric power input to said converter.

13. The motor drive and control method according to claim 12, wherein

when said motor operates in said regenerative mode, said voltage command value (Vmr) is temporarily determined, before said second step (S240-S260) is carried out, according to the number of revolutions (N) and a required driving force (Trq) of said motor (MG1, MG2).

14. The motor drive and control method according to claim 12, wherein

said second step includes a sub step (S250) of inhibiting, when said motor operates in said regenerative mode and the electric power (Pm) generated by said motor (MG1, MG2) exceeds the limiting value (Pcvlm) of electric power input to said converter (110), decrease of said voltage command value (Vmr).

15. The motor drive and control method according to claim 12, wherein

said second step includes a sub step (S260) of restricting, when said motor operates in said regenerative mode and the electric power (Vm) generated by said motor (MG1, MG2) is smaller than the limiting value (Pcvlm) of electric power input to said

converter (110), an amount of decrease (Pc) in said voltage command value (Vmr) so as to balance the amount of change (Pc) in stored electric power of said electric charge storage unit that is caused by the change of said second DC voltage with a combination of the limiting value (Pcvlm) of electric power input to said converter (110) and the electric power (Vm) generated by said motor.

16. The motor drive and control method according to any of claims 10 to 15, wherein

in said first or second step (S150, S240-S260), said amount of change (Pc) in stored electric power is calculated based on said voltage command value (Vmr).

17. The motor drive and control method according to any of claims 10 to 15, wherein

in said first or second step (S150, S240-S260), said amount of change (Pc) in stored electric power is calculated based on a detected value of said second DC voltage (Vm).